

REMARKS

This amendment is in response to a non-final Office action (Paper No. 11) dated 11 April 2003. Upon entry of this amendment, claims 1-20, 23, 24 and 27-32 will be pending. Applicant has canceled claims 21, 22, 25 and 26 without prejudice or disclaimer as to their subject matter by this amendment and has newly added claims 29-32 by this amendment.

In Paper No. 11, the Examiner wanted FIG. 1 labeled "Prior Art" because of FIG. 9 of U.S. Patent No. 5,278,584 to Keefe *et al.* Applicant has amended by this amendment FIG. 1 to now contain the caption "Prior Art". Applicant is appreciative of having FIG. 9 of USP 5,278,584 being called to Applicant's attention.

In Paper No. 11, the Examiner has rejected claims 1, 2, 4-16 and 18-22 under 35 U.S.C. 103 (a) as being unpatentable over U.S. Patent No. 5,841,452 to Silverbrook in view of Koto, U.S. Patent No. 4,368,478. The Examiner also rejected claims 1-3, 5, 7, 12, 13, 15, 17, 18 and 20-28 under 35 U.S.C. 103 (a) as being unpatentable over U.S. Patent No. 6,102,530 to Kim *et al.* in view of Browning *et al.*, U.S. Patent No. 6,132,033 and Koto '478. The Examiner also rejected claims 4, 6, 8, 9, 11 and 14 under 35 U.S.C. 103 (a) as being unpatentable over Kim '530 in view of Browning '033 and Koto '478 and further in view of Silverbrook '452. Applicant traverses these rejections.

In each of these grounds of rejections, the Examiner uses various combinations of

Silverbrook '452, Browning '033 and Kim '530 for teaching of the semiconductor structure of an ink jet print head having a ink reservoir, a manifold, a chamber, a nozzle plate and a heater. In each of these grounds of rejections, the Examiner relies solely on Koto '478 for a teaching of grooves on the inner surface of an ink passage.

Koto '478 pertains to an ink supply system that can operate effectively irregardless of the orientation of the ink supply system. In other words, the ink supply system does not have to have the nozzle 49 pointed downward to operate. Instead, the orientation of the system can be in any direction, so that the ink supply system of Koto '478 can be used in hand held calculators.

In order to operate well in any orientation, the ink supply system of Koto '478 must be able to manage bubbles effectively. Except for when the ink cartridge runs out of ink, these bubbles must not interfere with the quality of printing. Koto '478 also has a sensor to determine whether the ink supply is empty. The ink supply system of Koto '478 is designed so that a stray bubble will not trigger this sensor prematurely.

The ink supply system of Koto '478 essentially works by capillary action. Cartridge 58 supplies ink 65 through capillary tube 60 having sensor 61, 62 to hollow needle 57 to deliver ink 65 to air trapping chamber 55, then through porous member 54, then through filter 53 to nozzle 49 of printhead 51. A piezoelectric element 52 disposed on the printhead 51 vibrates the printhead 51 causing a droplet of ink to leave nozzle 49 and land on paper 45. Air is pushed into

ink cartridge 58 via air vent 64 to replace space of used ink in cartridge 58. Air trapping chamber 55 has an inner surface 55a. In one embodiment (FIG. 5), ink guide passages 56 are formed on portions of surface 55a. In another embodiment (FIG. 9A), inner surface 55a of air trapping chamber 55 has serrations or teeth 90. It is these serrations or teeth 90 of FIG. 9A of Koto '478 that the Examiner relies on in each ground of rejections in Paper No. 11 to reject each and every one of Applicant's claims.

In Paper No. 11, the Examiner asserts, many times that the serrations 90 of Koto '478 are used to improve flow and reduce flow resistance. Applicant disagrees. In addition, Applicant submits that such statements by the Examiner in Paper No. 11 are solely the product of improper hindsight reconstruction, where the Examiner uses Applicant's specification for a rationale to reject Applicant's claims.

The purpose of serrations 90 in Koto '478 are to (1) prevent a bubble from entirely blocking ink flow through the air trapping chamber 55 (col 7, lines 11-15 in a discussion about ink guide passages 56) or (2) to provide the required capillary action for the ink supply system (col 9, line 48). Serrations 90 in Koto '478 are not used to improve ink flow or to reduce flow resistance. Instead, it is portion 60' of capillary tube 60 that is used in Koto '478 to reduce passage resistance in capillary tube 60 (col 9, lines 33-37). However, reference numeral 60' is not the serrations or teeth 90. Neither Koto '478, nor none of the other applied prior art references ever teach or fairly suggest that grooves in an ink passage reduce flow resistance.

Applicant's specification teaches that grooves in the ink passage increase printing speed and decrease the time required to refill the ink chamber after ejection of an ink droplet. Applicant's specification teaches that this increased speed is brought on by increased surface area on the ink inlet passage afforded by the grooves. Applicant has reviewed Koto '478, Kim '530, Browning '033 and Silverbrook '452. Applicant cannot find any teaching, in any one or any combination of these four references, of either (1) that grooves in an ink inlet passage increase printing speed, (2) that grooves in the ink inlet passage decrease the time needed to refill an ink chamber after ejection of a droplet and/or (3) that grooves in an ink inlet passage increase print speed and decrease ink chamber refill time because grooves increase the surface area of the ink inlet passage. Therefore, Applicant submits that Applicant's claimed invention is not taught or fairly suggested by the applied prior art.

Silverbrook '452 is concerned with a semiconductor ink jet printhead, and more particularly, a structure for a print head that alleviates registration (or alignment or overlay) problems found in micro semiconductor ink jet print head devices. Browning '033 pertains to a semiconductor structure for an ink jet printhead that deters passage of bubbles. Kim '530 pertains to a semiconductor ink jet printhead structure that seeks to increase print speed by improving ink flow. In Paper No. 11, the Examiner combines various combinations of Silverbrook '452, Browning '033 and Kim '530 with Koto '478 to reject Applicant's claims. The Examiner justifies the combination of Koto '530 with the other references because the Examiner asserts, in Paper No. 11, that the serrations 90 in Koto '478 serve to improve ink flow

and reduce flow resistance. Applicant disagrees. Applicant submits that the purpose of serrations 90 in Koto '478 is not serve to improve ink flow or reduce flow resistance, but instead, to enable ink to flow when a bubble blocks the path and perhaps to improve the capillary effect in the non-semiconductor type ink jet print system of Koto '478. Since neither Silverbrook '452, Browning '033 or Kim '530 pertain to enabling ink to flow when a bubble blocks a passage, and are not concerned with improving capillary action, Applicant submits that one would not be motivated to turn to Koto '478 to fill in for the deficiencies of either Silverbrook '452, Browning '033 or Kim '530. This purpose and goals of Koto '478 are not coincident with the purpose and goals of Silverbrook '452, Kim '530 and Browning '033.

Further, it is also noted that unlike Silverbrook '452, Browning '033 and Kim '530, Koto '478 is not a semiconductor type ink jet printhead. This is important as the dimensions of the structures of Koto '478 are logarithmically greater than the dimensions of semiconductor ink jet print head features of Silverbrook '452, Browning '033 and Kim '530. For example, col 7, line 5 and col 9, line 30 of Koto '478 state that dimensions *within* a single nozzle of the ink supply system are 0.2, 0.3 and 1.0 mm. Meanwhile, col 3, line 7 of Browning '033 discuss dimensions of 14 and 25 microns. Col 6, line 53 of Browning '033 state that the pitch *between* adjacent resistors is 85 microns. Column 5, line 43 of Kim '530 states that the pitch *between* nozzle holes is 15 microns. Because of the huge disparity in sizes of the ink jet printhead structures between the semiconductor structures of Silverbrook '452, Browning '033 and Kim '530 and that the non semiconductor structure of Koto '478, Applicant submits that one of ordinary skill in the art

would not turn to Koto '478 to fill in for the deficiencies of Silverbrook '452, Browning '033 and Kim '530. This is because techniques used in the relatively large scale structure of Koto '478 generally do not work on the small scale micro versions of Silverbrook '452, Browning '033 and Kim '530 and vice versa.

In Applicant's claims, Applicant claims that the ink inlet passages containing the grooves supply and are thus connected to the ink chambers. Applicant submits that Koto '478 does not have these chambers between air trapping chamber 55 having serrations 90 and nozzle 49. The claiming of these chambers in Applicant's invention is important because a large amount of ink is in these chambers and this ink is expelled only to be refilled through a relatively narrow and small ink inlet passage. The fact that Koto '478 does not have these large chambers between nozzle 49 side of the air trapping chamber 55 is further evidence that the serrations 90 of Koto '478 are not used to improve ink flow or to speed ink flow as asserted by the Examiner. That is because in Koto '478, there is no need for the extra speed of ink flow through the air trapping chamber 55 because there is no equivalent ink chamber between the air trapping chamber 55 and the nozzle 49 that needs to be refilled quickly. Also, the fact that Koto '478 does not have a large ink chamber between the nozzle 49 and the air trapping chamber 55 is further proof that the serrations 90 were never intended to hasten the flow the a structures of Silverbrook '452, Browning '033 and Kim '530 as asserted by the Examiner in Paper No. 11.

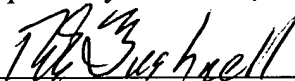
Applicant has newly added depending claims 29-32 by this amendment. These claims

claim features not taught or suggested by the applied prior art. Specifically, these claims claim the interrelationships between the ink flow channel, the ink chamber and the orifices in Applicant's structure. These claims also claim the relative dimensions between the ink inlet passage and the chamber. These relative dimensions were gleaned from FIGS. 2-4 of Applicant's specification.

No fees are incurred by the filing of this amendment.

In view of the above, all claims are deemed to be allowable and this application is believed to be in condition to be passed to issue. Reconsideration of the rejections and objections is requested. Should any questions remain unresolved, the Examiner is requested to telephone Applicant's attorney.

Respectfully submitted,


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FIG. 1 ~~(PRIOR ART)~~

